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Investigation of the Correlation Between Sleep Quality and Physical Activity Level in Dialysis Patients: A Descriptive Study

Diyaliz Hastalarında Fiziksel Aktivite Düzeyi ile Uyku Kalitesi Arasındaki İlişkinin Belirlenmesi: Tanımlayıcı Bir Çalışma

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Abstract

Objective: The objective of the current research study was to evaluate the influence of physical activity levels on the quality of sleep in dialysis patients.

Methods: The study involved 70 dialysis patients, with an average age of 54.74±17.12 years on average. The Turkish version of the international physical activity questionnaire (IPAQ) was employed to measure levels of physical activity. Sleep quality was evaluated using the Pittsburgh sleep quality index (PSQI).

Results: It was determined that 64.3% of the patients slept well. The average total physical activity score was 1627.66 metabolic equivalents, indicating that patients' physical activity levels were poor. In terms of physical activity levels, no statistically significant distinction was seen between the individuals with a PSQI score of 5 or less and patients, with a score greater than 5 ($p>0.05$). However, a weak negative correlation was discovered between the average walking and total physical activity scores on the IPAQ subscales and the subjective sleep quality subscale of the PSQI. The correlation values were $r=-0.238$, $p=0.047$ for average walking, and $r=-0.241$, $p=0.045$ for total physical activity.

Conclusion: The discovery is that dialysis patients had low levels of exercise but high-quality sleep. There was no significant association between physical activity levels and the quality of sleep. More thorough and intervention-oriented studies in the future are expected to contribute to a better understanding of this link.

Keywords: Dialysis patient, physical activity, sleep quality, Pittsburgh sleep quality index, international physical activity questionnaire

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Öz

Amaç: Bu araştırma çalışmasının amacı, diyaliz hastalarında fiziksel aktivite düzeylerinin uyku kalitesi üzerindeki etkisini değerlendirmektir.

Yöntem: Çalışmaya yaş ortalaması 54,74±17,12 olan 70 diyaliz hastası dahil edilmiştir. Fiziksel aktivite düzeylerini değerlendirmek için uluslararası fiziksel aktivite anketinin (UFAA) Türkçe versiyonu kullanılmıştır. Uyku kalitesi ise Pittsburgh uyku kalitesi indeksi (PUKİ) ile değerlendirilmiştir.

Bulgular: Hastaların %64,3'ünün iyi uyuduğu belirlenmiştir. Ortalama toplam fiziksel aktivite skoru 1627,66 metabolik eşdeğer olup, hastaların fiziksel aktivite düzeylerinin düşük olduğu gösterilmiştir. Fiziksel aktivite düzeyleri açısından, PUKİ skoru 5 veya daha düşük olan hastalar ile 5'ten büyük olan hastalar arasında istatistiksel olarak anlamlı bir fark bulunmamıştır (p>0,05). Ancak, UFAA alt ölçeklerinden ortalama yürüme ve toplam fiziksel aktivite skorları ile PUKİ'nin subjektif uyku kalitesi alt ölçeği arasında zayıf negatif bir korelasyon keşfedilmiştir (r=-0,238, p=0,047; r=-0,241, p=0,045).

Sonuç: Diyaliz hastalarının düşük fiziksel aktivite düzeylerine sahip olduğu, ancak uyku kalitelerinin yüksek olduğu tespit edilmiştir. Fiziksel aktivite düzeyleri ile uyku kalitesi arasında anlamlı bir ilişki bulunamamıştır. Gelecekte yapılacak daha kapsamlı ve müdahale odaklı çalışmaların bu ilişkinin daha iyi anlaşılmasına katkı sağlayacağı düşünülmektedir.

Anahtar Kelimeler: Diyaliz hastası, fiziksel aktivite, uyku kalitesi, Pittsburgh uyku kalitesi indeksi, uluslararası fiziksel aktivite anketi

Introduction

End-stage renal disease is a serious health condition defined by a glomerular filtration rate of less than 15 mL/min, severe uremic symptoms, and organ involvement[1]. In this stage, renal replacement therapy is required, with the primary goal of treatment being to extend life and maintain an ideal quality of life[2]. Despite technological breakthroughs in dialysis treatment, a variety of illness and treatment-related issues exist[3]. Sleep disorders are among the most frequent of these problems. Dialysis patients typically have sleep issues, such as sleep apnea syndrome, daytime drowsiness, insomnia, and restless leg syndrome[4].

The study found that between 50% and 80% of dialysis patients had subjective sleep disturbances, and 71% of them reported having inadequate quality of sleep[5]. Prolonged persistence of these illnesses causes daytime sleepiness and impairments in physical and mental functions in patients, lowering quality of life[6]. Furthermore, sleep disturbances might damage patients' overall health by decreasing their self-care abilities[6,7]. As a result, understanding the variables that contribute to sleep disorders, addressing them, and increasing sleep quality are critical[5].

It is commonly known that stress reduction, physical exercise, healthy eating, and health-conscious behavior all contribute to better quality of sleep[8,9]. It is commonly emphasized that physical activity makes it easier to fall asleep, and that people who exercise regularly enjoy better quality sleep[10]. Physical activity has been shown to enhance one's emotional and physical well-being[11-12]. However, research on the influence of physical activity on sleep in dialysis patients is sparse. Even while research indicates that exercise enhances the quality of sleep, it has primarily been examined as a sub-dimension of healthy living behaviors[13-17]. In the current studies, patients' physical activity levels have not been objectively measured, which precludes fully revealing the real influence of physical exercise on sleep. The current research study sought to accurately calculate dialysis patients' physical activity levels and determine how these levels affected sleep quality. Given the beneficial association between physical exercise and sleep quality, it is anticipated that this study will make an important contribution to health professionals and to the literature.

Materials and Methods

Ethical approval was given by the Aydın Adnan Menderes University Non-interventional Clinical Research Ethics Committee (approval date: 06.05.2022; protocol number: 2022/010).

The Study Sample

The current research study group includes 104 dialysis patients who were monitored at Aydın Adnan Menderes University, Faculty of Medicine, Research and Application Hospital, Department of Nephrology, Dialysis Unit, between May and November of 2022. Being at least 18, a history of hemodialysis for 6 months or more, undergoing dialysis 2 to 3 times per week, being able to communicate verbally, and not having severe mental problems (such as anxiety and depression), were the inclusion criteria of the study. The exclusion criteria were unwillingness to participate. The study enrolled 70 patients who met the inclusion criteria and agreed to participate.

Data Collection Tools

The data were collected using the patient information form, international physical activity questionnaire (IPAQ), and Pittsburgh sleep quality index (PSQI).

Patient information form: The questionnaire has two parts that were prepared by the researcher. The first section contains patients' socio-demographic information, whereas the second section contains variables connected to their disorders.

International physical activity questionnaire short form: Craig et al. (2003) designed the questionnaire, and Saglam et al.[18] investigated the validity and reliability of the Turkish versions of both the long and short forms of the questionnaire. In our study, we employed the questionnaire's short form. The short version, which consists of seven questions, collects data on the amount of time spent walking and engaging in moderate to strenuous physical activity. Individual physical activity levels were determined using metabolic equivalent (MET) values along with day and duration information for each activity. Accordingly, MET values below 600 (<600) are considered to be physically inactive, those between 600-3.000 are seen as having little physical activity, and those above 3.000 (>3.000) are considered to have a high (sufficient) level of physical activity[18].

Pittsburgh sleep quality index: This index was created by Buysse et al. (1989) and translated into Turkish by Ağargün et al.[19]. The quality of sleep was evaluated using the PSQI during the previous month. The index is divided into seven subscales: subjective quality of sleep, sleep latency, length of sleep, habitual efficiency of sleep, disruption of sleep, use of sleeping pills, and daytime sleepiness. A subscale's rating ranges from 0 to 3, and the overall score can be anywhere from 0 to 21. A cumulative score beyond five indicates inadequate quality of sleep[19]. Data were gathered through face-to-face interviews at a time convenient for the patients. Participation in the study lasted an average of 10 minutes.

Statistical Analysis

The data were analyzed using IBM SPSS Statistics 25 (Armonk, NY: IBM Corp.). Descriptive statistics were given as mean ± standard deviation for continuous variables and frequency, and % for categorical variables. The Kolmogorov-Smirnov test was employed to assess the data's compliance with a normal distribution. The independent samples t-test was employed to examine differences between independent groups when the assumptions for parametric testing were fulfilled; if not, the Mann-Whitney U test was utilized. To examine the relationship between numerical variables, the Spearman correlation coefficient was utilized. The threshold for statistical significance was set at $p<0.05$ for every assessment.

Results

The current study investigated the effect of dialysis patients' physical activity levels, on sleep quality, and the results are shown below.

Socio-demographic and Clinical Characteristics

The patients who took part in the trial were 54.74±17.12 years old on average, 55.7% of the patients were male, 70% were primary/secondary school graduates, 71.4% were married, 70% were not employed, and 87.1% lived with their families. Ninety percent of the patients rated their socio-economic status as "moderate". In addition, 50% of the patients stated that they did not know the cause of their kidney disease, while 64.3% stated that they had comorbidities. When renal replacement therapy methods were analyzed, it was found that 21.4% of the patients received hemodialysis, 17.1% received home hemodialysis, 35.7% received hemodiafiltration, and 25.7% received peritoneal dialysis. The average duration of dialysis treatment was 3.67±2.96 years (Table 1).

Sleep Quality and Physical Activity Levels

The average PSQI total score of the patients who participated in the study was calculated as 5.2±3.32. Sixty-four point three percent of the patients had a PSQI score of 5 and below, indicating good sleep quality (Table 2).

Regarding physical activity levels, the average scores were: vigorous physical activity, 464.57±1513.48; moderate physical activity, 634.86±1287.64; walking, 528.24±779.61; and total physical activity, 1627.66±2671.12 (Table 3).

The Relationship Between Sleep Quality and Physical Activity Levels

There were no statistically significant differences in walking, moderate, or vigorous activity, according to an examination of the patients' physical activity levels in connection to their PSQI ratings ($p>0.05$). The statistical analysis indicated that there was no significant difference between (509.33±1728.99) between patients with a PSQI score of 5 or less and the average vigorous physical activity score (384±1046.14)

of patients with a PSQI score greater than 5 (p=0.793). Similarly, no statistical significance was found for moderate physical activity (p=0.621) and walking scores (p=0.852). The cumulative physical activity scores of the PSQI groups did not exhibit any significant difference (p=0.721) (Table 4).

Table 1. Socio-demographic and clinical characteristics

Variable	n	%
Age (mean ± SD, years)	54.74±17.12 (20-88)	
Gender		
Female	31	44.3
Male	39	55.7
Education level		
Primary/secondary	49	70
High school and above	21	30.0
Marital status		
Single	20	28.6
Married	50	71.4
Employment status		
Employed	21	30
Unemployed	49	70
Living situation		
Alone	9	12.9
Living with family	61	87.1
Socio-economic status		
Low	6	8.6
Medium	63	90.0
High	1	1.4
Primary kidney disease		
Unknown	35	50.0
Hypertensive nephropathy	9	12.9
Diabetic nephropathy	14	20.0
Other	12	17.1
Presence of other diseases		
Yes	45	64.3
No	25	35.7
Type of dialysis		
Hemodialysis	15	21.4
Home hemodialysis	12	17.1
Hemodiafiltration	25	35.7
Peritoneal dialysis	18	25.7
Duration of dialysis (mean ± SD, years)	3.67±2.96 (0.5-13)	

SD: Standard deviation

The Relationship Between Sleep Quality Subscales and Physical Activity

The PSQI was not significantly correlated with physical activity levels in the following subscales: subjective sleep quality, sleep latency, duration, habitual sleep efficiency, sleep disruption, use of sleeping medication, and daytime sleep dysfunction (p>0.05). The subjective sleep quality subscale (subscale 1) of the PSQI, however, showed a weakly significant negative correlation with walking (r=-0.238; p=0.047) and overall physical activity (r=-0.241; p=0.045) (Table 5). This finding implies that an increase in walking and overall physical activity levels leads to an enhancement in, so does the subjective perception of sleep quality.

Discussion

The goal of this research was to assess how the levels of physical exercise in dialysis patients levels of physical exercise affected their quality of sleep. Our findings are in line with previous research , but they also diverge slightly from it.

The age range of the patients involved in our study was 20 to 88 years, with an mean age of 54.74±17.12 years. Studies have demonstrated that older individuals undergoing hemodialysis often report poor sleep quality due to these factors. For example, Sert et al.[20] observed that sleep quality declines with age and is further exacerbated by comorbidities and reduced physical activity, contributing to impaired quality of life and higher mortality rates. Similarly, Sabet et al.[21] reported a high prevalence of poor sleep quality among

Table 2. Distribution of Pittsburgh sleep quality index (PSQI) scores

Variable	n	%
Good sleep quality (total PSQI ≤5)	45	64.3
Poor sleep quality (total PSQI >5)	25	35.7
Total PSQI (mean ± SD)	5.2±3.32	

PSQI: Pittsburgh sleep quality index, SD: Standard deviation

Table 3. Distribution of international physical activity questionnaire (IPAQ) scores

Variable	Mean ± SD
Vigorous physical activity	464.57±1513.48
Moderate physical activity	634.86±1287.64
Walking	528.24±779.61
Total physical activity	1627.66±2671.12

IPAQ: International physical activity questionnaire, SD: Standard deviation

Table 4. Comparison of PSQI classification and IPAQ mean scores in dialysis patients

Variable	Good sleep quality (total PSQI ≤5)	Poor sleep quality (total PSQI >5)	p
	Mean ± SD	Mean ± SD	
Vigorous physical activity	509.33±1728.99	384±1046.14	0.793 (z=-0.262)
Moderate physical activity	586.67±1141.9	721.6±1537.55	0.621 (z=-0.494)
Walking	483.27±687.23	609.18±933.22	0.852 (z=-0.186)
Total physical activity	1579.27±2830.58	1714.78±2410.68	0.721 (z=-0.357)

PSQI: Pittsburgh sleep quality index, SD: Standard deviation

Table 5. Comparison of PSQI and IPAQ mean scores in dialysis patients

Variable		PSQI subscales							
		Subjective sleep quality	Sleep latency (delay)	Sleep duration	Habitual sleep efficiency	Sleep disturbances	Use of sleep medications	Daytime dysfunction	Total PSQI
Vigorous physical activity	r	-0.179	-0.102	0.008	0.014	0.019	-0.113	-0.061	-0.068
	p	0.138	0.401	0.948	0.910	0.879	0.353	0.616	0.578
Moderate physical activity	r	-0.148	0.006	0.004	-0.154	0.113	-0.006	-0.168	-0.059
	p	0.223	0.960	0.976	0.203	0.350	0.960	0.166	0.627
Walking	r	-0.238*	-0.117	0.023	0.052	-0.037	-0.184	-0.033	-0.126
	p	0.047	0.333	0.849	0.668	0.764	0.127	0.786	0.297
Total physical activity	r	-0.241*	-0.091	-0.036	-0.085	0.103	-0.134	-0.134	-0.132
	p	0.045	0.453	0.768	0.485	0.396	0.269	0.268	0.275

*p<0.05 indicates a statistically significant relationship; r: Spearman correlation coefficient
PSQI: Pittsburgh sleep quality index, IPAQ: International physical activity questionnaire, SD: Standard deviation

hemodialysis patients, with advanced age and associated factors as major contributors.

In contrast, the younger age of participants in our study (mean age 54.74±17.12 years) may account for their relatively better reported sleep quality. Younger individuals are often in better physical and psychological health, which could positively influence their sleep quality. This observation aligns with the findings of Parvan et al.,[22] who noted that younger hemodialysis patients [average age of 58.03 (range 20-87)] tended to report better sleep quality and an improved quality of life compared to older patients.

Individuals in the younger age bracket might be in better physical and psychological health, which could have a favorable impact on the quality of their sleep.

The PSQI was employed to evaluate the participants' quality of sleep. The mean PSQI score was 5.2±3.32 (Table 2). Sixty-four point three percent of the participants obtained a PSQI score of five or lower, indicating that their sleep quality was good. Contrary to the findings of our study, a number of reports in the literature indicate that sleep issues are common among dialysis patients[4,20]. For instance, Sabet et al.[21] discovered that 73.8% of hemodialysis patients slept poorly, with a mean PSQI score of 8.39±4.04. Comparably, this rate was reported as 83.3% by Parvan et al.[22]. Eighty-one point five percent of the patients, according to Sert et al.,[20] reported poor sleep quality. We ascribe the lower rates in our study to the younger age group and lower rates of comorbidity among the participants.

The average total physical activity score was 1627.66 metabolic equivalents (METs), which suggests that the patients did not engage in high levels of physical activity (Table 3). These findings support earlier research in the literature that has shown dialysis patients typically engage in little physical exercise[11]. Cupisti et al.[23] came to the conclusion that even dialysis patients without significant physical or neurological disability or acute sickness frequently engaged in low levels of physical activity. Li et al.[24] discovered that dialysis patients were less physically active than healthy people, with notable restricted possibilities seen most noticeably in walking activities related to home chores and transportation. In a

study of hemodialysis patients, Fiaccadori et al.[25] came to realize that only 19% of patients were physically active, while 52% were not active at all.

Comparing the results of our study to those published in the literature, we also discovered decreased levels of physical activity. According to Oskay et al.,[26] peritoneal dialysis patients scored 377±870 for walking, 200±217 for moderate physical activity, and 0 for strenuous physical activity. Five hundred ninety-six ± one thousand thirteen was determined to be the average overall physical activity score. Additionally, Wu et al.[27] observed that physical activity levels ≤599 MET were present in 55% of hemodialysis patients. Turkish dialysis patients showed considerably lower levels of physical activity than the healthy group, according to Daskapan et al.[28]. It was shown that just 1.4% of the dialysis patients taking part in the trial were active, while 78.12% were inactive and 20.84% were insufficient. Some of the individuals in our study engaged in more physical activity than those in earlier trials, which might be explained by the fact that the patient group was younger and in general healthier. Furthermore, we think that because the IPAQ is a memory-based evaluation instrument, it might result in different computations. Therefore, it is advised to increase the accuracy of physical activity level by utilizing more dependable instruments, such as accelerometers[29].

According to an examination of the connection between physical activity and sleep quality (Table 4), there was no discernible difference in physical activity levels between the group with a PSQI score of five or less and the group with a score above five ($p>0.05$). This suggests that low physical activity does not have a significant effect on sleep quality. Walking and total physical activity scores showed a significant, albeit weak, negative correlation with the PSQI's subscale 1 (subjective sleep quality) ($r=-0.238$, $p=0.047$; $r=-0.241$, $p=0.045$) (Table 5). This suggests that people who walk more may perceive their sleep quality better. Studies have also shown that low-intensity activities, like walking, have a positive impact on sleep quality[15]. The poor link between physical activity and sleep quality, however, raises the possibility that other biological or psychological variables may be significant sleep determinants.

Studies examining the effects of exercise on sleep in dialysis patients are scarce in the literature. Research has shown that when patients' levels of physical activity rose, so did the quality of their sleep[13-17]. Nonetheless, physical activity has been evaluated as a subscale of healthy living practices in the research that is currently accessible[9,13,17]. The patients' levels of physical activity have not been computed. We believe that these evaluations are inadequate to ascertain the real-world impact of exercise on dialysis patients' sleep quality.

Rezaie and Naji's[30] study on hemodialysis patients reported no significant link between physical exercise and the quality of sleep, which is consistent with our study results. The lack of a significant correlation between low physical activity levels and sleep quality in our study might be explained by the individuals' generally modest activity levels.

Study Limitations

Only dialysis patients treated between May and November 2022 in the Nephrology Department, Dialysis Unit, Research and Application Hospital, Faculty of Medicine, Aydın Adnan Menderes University, were included in the study. As a result, the findings are limited to this particular patient population and might not directly apply to dialysis patients in other regions or with other demographic traits.

The study aimed to provide a general perspective on the relationship between physical activity levels and sleep quality rather than controlling for all factors influencing sleep quality. Therefore, group homogeneity was not ensured, and factors such as comorbidities, smoking, and alcohol use were not assessed in detail. Additionally, although it is well-known that post-dialysis fatigue can directly impact sleep quality, this study did not perform a detailed evaluation of general fatigue levels. Future studies should comprehensively address such factors to gain a better understanding of the biological and psychosocial variables influencing sleep quality.

Conclusion

The current study found that dialysis patients frequently had low levels of physical activity and poor sleep quality. Because of the low comorbidity rates and the young average age of the patient group, the results differed from those of previous studies in the literature. It has been noted that increasing the amount of exercise performed can improve the quality of sleep, but the effect must be substantial.

Furthermore, the study's cross-sectional design makes it more difficult to establish a clear link between increased physical activity and better sleep. Therefore, longer-term, intervention-based studies are needed to provide a deeper knowledge of the relationship between physical activity and

quality of sleep in dialysis patients. Such further study will help shape to improve the quality of life for dialysis patients. It is expected that this research will open doors for greater sample sizes and more in-depth studies.

Ethics

Ethics Committee Approval: This randomized controlled trial was conducted in accordance with the principles outlined in the Declaration of Helsinki. Study presentation followed the guidelines set by the Consolidation Standards of Reporting Trials (CONSORT). Ethical approval was given by the Aydın Adnan Menderes University Non-Interventional Clinical Research Ethics Committee (approval date: 06.05.2022; protocol number: 2022/010).

Informed Consent: Since the study was conducted retrospectively, no formal written informed consent was obtained from the patients.

Footnotes

Authorship Contributions

Concept: A.K., N.Ö., Z.G.Z., Design: A.K., N.Ö., Z.G.Z., Data Collection or Processing: A.K., N.Ö., Z.G.Z., Analysis or Interpretation: A.K., N.Ö., Z.G.Z., Literature Search: A.K., N.Ö., Z.G.Z., Writing: A.K., N.Ö., Z.G.Z.,

Conflict of Interest: All authors contributed to the conception, design, execution, and analysis of the study and approved the final version of the manuscript. **Financial Disclosure:** The authors confirm that this research did not receive any financial support.

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